NETROPY® RECORDER

USER'S GUIDE

Version 1.0

APPOSITE®

TECHNOLOGIES

Netropy® Recorder User's Guide

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1 OVERVIEW

The Netropy Recorder is an application for Windows and Linux that captures and records the delay and loss characteristics over time of a wide-area network link or network path. The Netropy Recorder is designed for use in conjunction with the recording playback functionality of the Netropy network emulator. The Netropy Recorder captures the conditions of the live network and saves them to a recording file. Recording files are loaded into the Netropy network emulator and the time sequence replayed as the delay and loss of any emulated path, reproducing the characteristics of a live link in a repeatable test environment. For more information on playback of recording files, please consult the *Netropy Network Emulator User's Guide*.

The Netropy Recorder sends ICMP echo requests, commonly referred to as "Pings," from the PC on which it is running to a specified device on the other side of the network, and captures the reported delay and loss values. The Netropy Recorder can probe the link up to ten times per second and record up to 100,000 data points. By using the zoom controls, particular periods of interest can be displayed and saved in separate recordings for individual playback.

The Netropy Recorder uses an open file format described in the Recording File Format section of this document. The data saved by the Netropy Recorder can be reviewed and edited. Users can also manually create their own recording files to generate any desired time sequence of delay and loss conditions. Although the Netropy Recorder does not record link bandwidth, manually created or modified recording files may include bandwidth values that can be replayed by the Netropy network emulator in addition to loss and delay conditions.

The Netropy Recorder is available at no charge to users of the Netropy network emulator. The latest version of the Netropy Recorder can be downloaded from the Netropy support section of the Apposite website at www.apposite-tech.com.

The Apposite Recorder for Android™ provides similar functionality on Android-based phones and tablets. Most features of the Netropy Recorder for Windows and Linux and the Apposite Recorder for Android are identical, but there are some minor differences. Please refer to the Help text within the Apposite Recorder for details of its operation. The Apposite Recorder for Android is available for free download on Google Play™.

2 INSTALLATION

The Netropy Recorder runs on Windows 10, 8, 7, and XP, and on Linux distributions Debian 7+, Ubuntu 12+, and Fedora 17+. It must run in an account with appropriate permissions to access the network. Please ensure that all firewall and anti-virus software are configured to allow the Netropy Recorder to access the network.

2.1 Installation on Windows

To install the Netropy Recorder, click on the setup file and follow the instructions on the screen.

To uninstall the Netropy Recorder, click on Windows Start > All Programs > Netropy Recorder > Uninstall Netropy Recorder.

2.2 Installation on Linux

To install the package on Fedora:

```
sudo yum install wxGTK wxPython python-matplotlib python-matplotlib-wx
sudo rpm -ivh netropy-recorder-1.0.1-1.noarch.rpm
sudo netropy-recorder
```

To install the package on Ubuntu or Debian:

```
sudo apt-get install python-matplotlib python-wxgtk2.8
sudo dpkg -i netropy-recorder_1.0.1-1_all.deb
sudo netropy-recorder
```

The Netropy Recorder requires root privilege on Linux to send ICMP packets. Run the Netropy Recorder from the root account or use `sudo`, e.g.:

```
sudo netropy-recorder
```
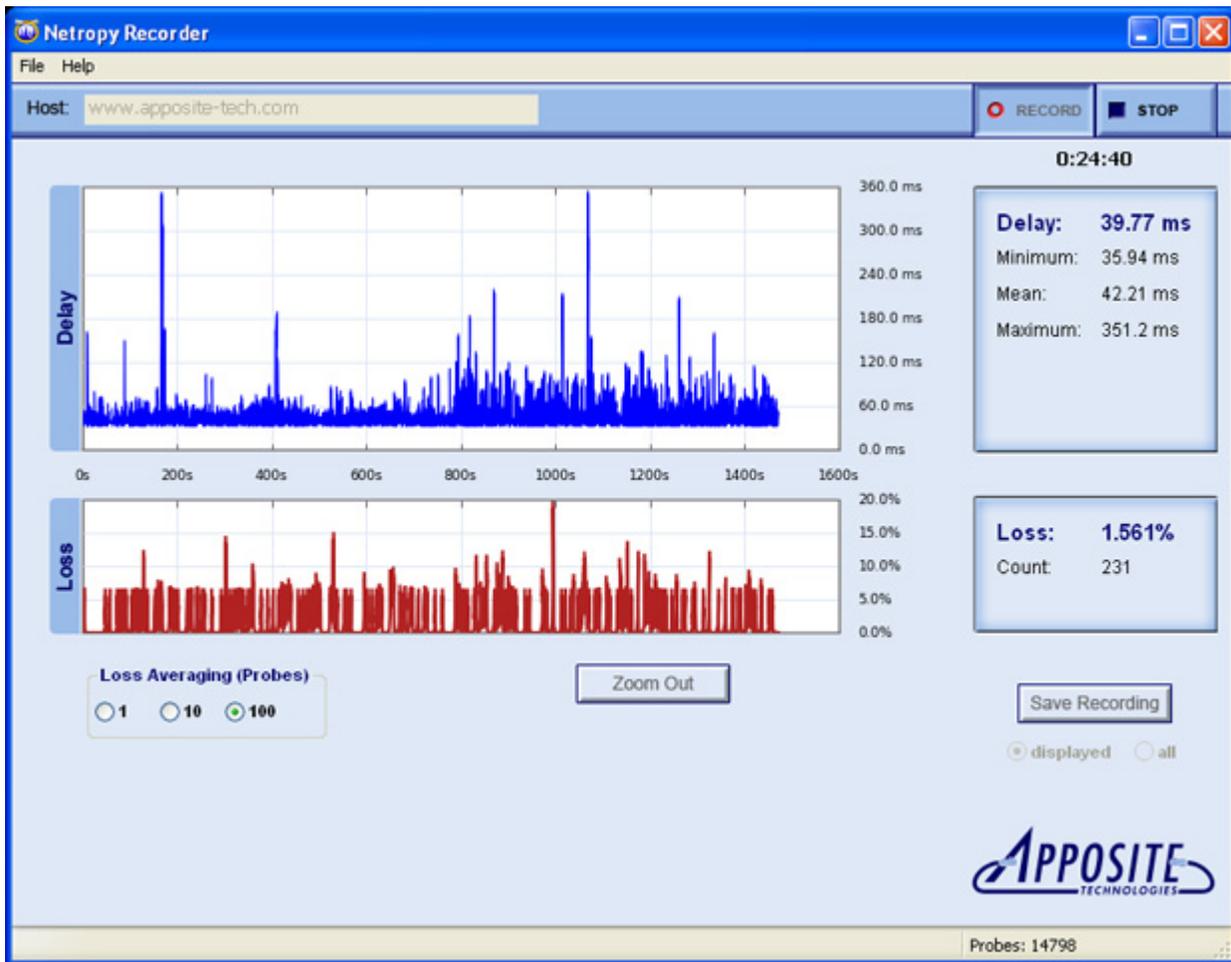
Netropy Recorder Main Screen

3 OPERATION

To use the Netropy Recorder, first open the application. On the top bar of the main screen, specify an IP address or host name of a device on the other side of the network. The Netropy Recorder collects delay and loss statistics for the network path between the PC on which the Netropy Recorder is running and the specified remote device. Please ensure that the remote device can respond to ICMP echo requests, and that any firewalls between the two devices do not block ICMP packets.

3.1 Recording Controls — Record, Stop, Save

To begin collecting data, press the *Record* button. While the Recorder is running, other controls except for Loss Averaging interval selector are disabled. When finished, press *Stop*.

To save the data to a recording file, click the *Save Recording* button. If the zoom in /out controls have been used to display a portion of the full recording, a radio button below the *Save Recording* button selects whether the entire recording or only the subset currently displayed is saved.

Once the recording has been saved, it can be viewed, edited, and loaded into the Netropy network emulator.

> ⚠️ Be sure to save any data prior to starting a new recording. Previously captured data are cleared when the *Record* button is pressed.

3.2 Zoom In / Zoom Out

To zoom in on a particular time interval of interest, place the cursor over the Delay or Loss graph, hold down the left mouse button, and highlight the interval to view. Once the mouse is released, the graph will zoom in to display the selected interval. The graph can be progressively zoomed in to smaller intervals up to the maximum precision of the data.

To zoom back out, click on the *Zoom Out* button. Each click on the *Zoom Out* button will undo one zoom operation.

3.3 Loss Averaging

A single probe can only generate a loss rate of either 0% or 100%. Individual probes are aggregated to produce composite values that are displayed on the graph and saved in the recording file. The Loss Averaging interval selector specifies the number of probes to use to produce the composite loss values. Click on the appropriate radio button to choose between 1, 10, and 100 probes. By default, loss values are averaged over 10 probes.

Longer averaging intervals use more data points and therefore offer greater granularity, but can miss short term effects. A loss averaging rate of 1 probe turns off averaging and shows each individual loss event.

☞ To capture short-term effects with greater precision, use a shorter probe interval to generate more data points over the same time period.

The loss rate at any point in time is calculated as a rolling weighted average over the loss averaging interval, centered on that point in time. For example, a loss averaging interval of 10 seconds means that the reported value for any point in time is an average of the loss rate reported in the 5 seconds before and 5 seconds after that point, weighted towards the values closest to the center of the interval. The end of the loss graph is adjusted as probes return.

4 OPTIONS

4.1 Probe Interval

To change the frequency of the probes, click on File > Options, and use the drop-down selector to choose the desired probe interval.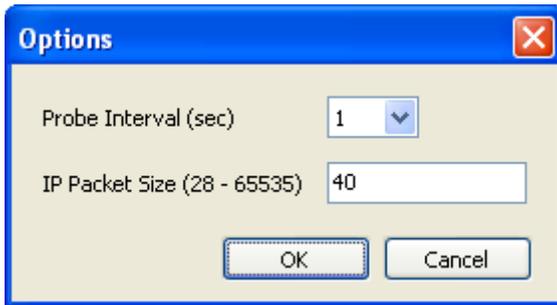 By default, the Netropy Recorder probes the link once per second. To capture short-term effects with greater precision, use a shorter probe interval to generate more data points over the same time period. To reduce the load on the network, particularly when using large packets, or to record more than 24 hours of link conditions, select a longer probe interval.

The table to the right shows the maximum recording time for different probe intervals.

The probe interval can not be changed while recording is in progress.

Probe Interval (sec.)	Max. Recording Time
0.1	2 hours, 46 minutes
0.5	13 hours, 53 minutes
1	27 hours, 47 minutes
2	2 days, 7 hours
5	5 days, 18 hours
10	11 days, 13 hours

4.2 IP Packet Size

To change the size of the probe packets, click on File > Options, and enter the desired size of the IP packet in bytes. By default, the Netropy Recorder uses 40 byte probes. The probe may be any size between 28 and 65535 bytes.

The packet size can not be changed while recording is in progress.

⚠	Some devices may not respond to the probe if the packet size causes fragmentation (usually greater than 1500 bytes).

5 DATA

The ICMP echo request probes used by the Netropy Recorder can only determine the delay and loss for the round trip from the Recorder to the remote device and back. The delay and loss graphs show these round-trip values. When saving the recording file, the data is converted into symmetric, one-way values:

‣ Delay: the one-way delay in each direction is calculated as half the round-trip time (RTT).

‣ Loss: the one-way loss rate in each direction is derived such that the probability of packet loss over two one-way trips matches the reported round-trip loss rate.

6 RECORDING FILE FORMAT

Recordings are text files with the format described in the table below. The recording file may contain up to 100,000 lines of data and a maximum of 10 MB.

Although the Netropy Recorder does not record link bandwidth, the recording file can include bandwidth values that can be replayed by the Netropy network emulator.

Line Type	Syntax and Description

metadata	`<attribute> : <value>`
	
	A list of attributes of the recording and their values. Must be at the beginning of the file, prior to any recording data, and preceded by a "#" symbol. Defined attributes are:
	
	`# Name (or # title) : <recording name/title>`
	
	The title of the recording. The Recorder creates a title of `"<hostname> to <destname>"`. The `hostname` is the system running the Recorder. The `destname` is the name or IP address entered in the host field of the Recorder.
	
	`# Description : <description>`
	
	A description of the recording. May include multiple description items which will be concatenated.
	
	The recording file generated by the Netropy Recorder will include the following description items:
	
	`# Description : Netropy Recorder Version <version number>`
	
	Software version number.
	
	`# Description : Start Time : <time>`
	
	The local time that the recording was started.
	
	`# Description : Probe Interval : <interval>`
	
	The frequency of the probes, as specified in the Options dialog.
	
	`# Description : Packet Size : <size>`
	
	The size of the probe packets, as specified in the Options dialog.
	
	`# Description : Loss Averaging : <value>`
	
	The setting for the Loss Averaging at the time the recording was saved.
	
	`# Contents : <impairment 1, impairment 2, ..., impairment n>`
	
	An ordered, comma-separated list of impairment names that defines the fields of the data section. Valid impairment names are limited to BW, DELAY and LOSS, For example:
	`# Contents : DELAY,LOSS`
	`# Contents : BW,DELAY,LOSS`
	
	If the contents are not specified, "DELAY,LOSS" is assumed.

data	`<start time> <impairment 1 value> [<impairment 2 value>]`
	`[<impairment 3 value>]`
	
	Start time is the time in seconds, relative to the beginning of the recording, when the delay and loss values of the line take effect. Start time is a floating point number and must be at least 0.001 seconds greater than the start time of the previous line. There cannot be more than 10 lines in any one second period. On the final line in the recording file, the start time is used only to determine the duration of the previous line with delay and loss values ignored.
	
	Delay values are specified as latency in milliseconds with a resolution of 0.01 ms.
	
	Loss values are specified as the packet loss rate in percent (without the percent sign) between 0.0000 and 100.0000.
	
	Bandwidth values are specified in bits per second.

7 EXAMPLE RECORDING FILE

The following is a short example of a hand-created recording file with delay and loss parameters. Within the first second, the loss values change five times, then remain constant for 19 seconds, then the delay changes over the next 30 seconds.

```
# Name : Example Recording
# Contents : DELAY,LOSS
0, 52.5, 0
0.2, 52.5, 25.0
0.4, 52.5, 50.0
0.6, 52.5, 75.0
0.8, 52.5, 50.0
1.0, 52.5, 25.0
20.0, 52.5, 0
25.0, 52.5, 0
30.0, 60.0, 0
40.0, 75.0, 0
50.0, 100.0, 0
```

8 SUPPORT

If you experience any problem with the Netropy Recorder, please check the Apposite website at http://www.apposite-tech.com for updated software and documentation. If your problem is not resolved, please contact Apposite Support at:

> support@apposite-tech.com
> 1.310.477.9955 ext. 2

Please be sure to include the following information:

‣ Netropy model

‣ Serial number

‣ Your e-mail address and phone number

‣ Software version number

‣ A detailed description of the problem

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